



NIH PUBLIC ACCESS

Author Manuscript

Int J Eat Disord. Author manuscript; available in PMC 2011 July 1.

Published in final edited form as:

Int J Eat Disord. 2011 April ; 44(3): 225–232. doi:10.1002/eat.20804.

Life Beyond the Eating Disorder: Education, Relationships, and Reproduction

Millie Maxwell, PhD¹, Laura M. Thornton, PhD¹, Tammy L. Root, PhD¹, Andrea Poyastro Pinheiro, MD, PhD¹, Michael Strober, PhD², Harry Brandt, MD³, Steve Crawford, MD³, Scott Crow, MD⁴, Manfred M. Fichter, MD⁵, Katherine A. Halmi, MD⁶, Craig Johnson, PhD⁷, Allan S. Kaplan, MD⁸, Pamela Keel, PhD⁹, Kelly L. Klump, PhD¹⁰, Maria LaVia, MD¹, James E. Mitchell, MD¹¹, Kathy Plotnicov, PhD¹², Alessandro Rotondo, MD¹³, D. Blake Woodside, MD⁸, Wade H. Berrettini, MD, PhD¹⁴, Walter H. Kaye, MD¹⁵, and Cynthia M. Bulik, Ph.D^{1,16}

¹ Department of Psychiatry, University of North Carolina at Chapel Hill ² Department of Psychiatry and Biobehavioral Sciences, David Geffen School of Medicine, University of California at Los Angeles, Los Angeles, CA, United States of America ³ Department of Psychiatry, University of Maryland School of Medicine, Baltimore, Maryland ⁴ Department of Psychiatry, University of Minnesota, Minneapolis, MN ⁵ Klinik Roseneck, Hospital for Behavioral Medicine and University of Munich (LMU), Munich, Germany ⁶ New York Presbyterian Hospital-Westchester Division, Weill Medical College of Cornell University, White Plains, New York ⁷ Laureate Psychiatric Clinic and Hospital, Tulsa, Oklahoma ⁸ Department of Psychiatry, The Toronto Hospital, Toronto, Canada ⁹ Department of Psychology, Florida State University, Tallahassee, Florida ¹⁰ Department of Psychology, Michigan State University, East Lansing, Michigan ¹¹ Department of Psychology, Neuropsychiatric Research Institute, Fargo, North Dakota ¹² Department of Psychiatry, University of Pittsburgh, Pittsburgh, Pennsylvania ¹³ Department of Psychiatry, Pharmacology and Biotechnologies, University of Pisa, Pisa, Italy ¹⁴ Department of Psychiatry, University of Pennsylvania, School of Medicine, Philadelphia, Pennsylvania ¹⁵ Department of Psychiatry, University of California, San Diego, California ¹⁶ Department of Nutrition, University of North Carolina at Chapel Hill

Abstract

Objective—We investigated sociodemographic characteristics in women with and without lifetime eating disorders.

Method—Participants were from a multi-site international study of eating disorders ($N = 2096$). Education level, relationship status, and reproductive status were examined across eating disorder subtypes and compared with a healthy control group.

Results—Overall, women with eating disorders were less educated than controls, and duration of illness and age of onset were associated with educational attainment. Menstrual status was associated with both relationship and reproductive status, but eating disorder subtypes did not differ significantly from each other or from healthy controls on these dimensions.

Conclusion—Differences in educational attainment, relationships, and reproduction do exist in individuals with eating disorders and are differentially associated with various eating disorder

symptoms and characteristics. These data could assist with educating patients and family members about long-term consequences of eating disorders.

Keywords

Children; relationship; education; anorexia nervosa; bulimia nervosa; amenorrhea

Although the psychopathological course of eating disorders has been well studied, far less is known about contextual factors that are impacted by the illness and may signify a return to healthy functioning.¹ In anorexia nervosa (AN), weight restoration usually occurs more rapidly than psychological indicators of clinical recovery,² body fat composition may be in a healthy range despite restrictive eating,³ and psychiatric and social impairment can exist long after the abatement and elimination of maladaptive eating behaviors.⁴ Physical markers of health, perhaps, only signify the beginning of recovery. Thus, focusing on the most amenable and measurable outcomes may limit our ability to appraise recovery across social, educational, and occupational domains.

In the general population, socioeconomic status (SES), employment, education, and marital status are associated with quality of life⁵. Eating disorder studies examining SES and work status present mixed results.^{6, 7} SES is often determined by factors outside of one's locus of control, especially for adolescents, and work status would likely be impacted by illness at the time of study. Therefore, this study focuses on education, relationships, and reproduction to capture key domains of interpersonal functioning. These characteristics are commonly associated with adjustment and identified by current and former eating disordered individuals as central to their quality of life.⁸

Education

Frequently reported premorbid characteristics of individuals with AN include strong work ethic, high levels of academic performance, extreme perfectionism, and reward-dependent traits.^{9–11} Yet cognitive decline and impaired concentration can accompany starvation and depression when the illness becomes entrenched.¹² Limited research has noted deficits in combined educational or occupational roles¹³ and impaired concentration,^{14, 15} and body image disturbance has been inversely correlated to grade point average in college students.¹⁶ A large population-based twin study reported no significant differences in educational attainment between individuals with AN, their unaffected twins, and a healthy control group. However, the narrow and young age range of their sample (16–28 years) may have influenced the range of observations as many individuals were still in school.¹⁷

Relationship Status

Social support, including marriage, confers both physical and mental health benefits¹⁸ and has been associated with life satisfaction¹⁹ and longer life expectancy.²⁰ Seeking social support has been linked to recovery in eating disorders whereas the absence of support typifies many with persisting illness.²¹ College students with AN and bulimia nervosa (BN) have been characterized as deficient in social support, with narrower social networks, a lack of romantic partner, and delays in psychosexual development.^{22, 23} Marriage and parenthood have even been associated with decreases in disordered eating,²⁴ but few studies to date have examined differences between married and unmarried women with eating disorders. An early review noted longer duration of illness and more bulimic behaviors in married women, but the lack of control for relevant confounders limits interpretation of the findings.²⁵ Eating disorders have been associated with decreased intimacy²⁶ and communication²⁷ and increased sexual problems.²⁸ In a previous investigation, women with restricting and purging AN more commonly reported loss of libido than women with BN

and eating disorder not otherwise specified (EDNOS; 75%, 74.6%, 39%, and 45.4%, respectively).²⁹ On the other hand, women with eating disorders do not seem to differ from healthy controls in the desire for, or value of, romantic relationships and desire for a child.²³

Reproduction

Women with eating disorders often ask whether their illness will affect future ability to conceive.³⁰ AN was historically assumed to be associated with compromised fertility,³¹ and evidence regarding infertility and pregnancy is mixed. Women with AN in particular may be overrepresented in fertility clinics,³² and eating disorders have been associated with increased risk for miscarriages, Caesarean deliveries, pre-term deliveries, low-weight births,³³ and menstrual irregularity.³⁴ Symptom severity 5 years after treatment for BN was inversely related to having a child.³⁵ In contrast, a 10–15 year follow-up study revealed few reproductive consequences from a history of BN, and women with AN have demonstrated comparable pregnancy rates to healthy controls.^{30, 33} It appears that a history of AN or BN does not preclude having a child, though it may complicate the process considerably.

Summary and Study Goals

Eating disorders have been generally associated with poor social functioning³⁶ and lower physical, mental, and social quality of life;³⁷ however, little is known about specific socio-demographic variables that may be indirect measures of functioning. The aims of this exploratory analysis were: (1) to provide information on education, relationship status, and reproduction in a large, well-characterized sample; (2) to compare education, relationship status, and reproductive status across eating disorder subtypes and relative to healthy controls; and (3) to examine the influence of age of onset, illness duration, age at interview, and lifetime minimum and maximum BMI on these contextual factors.

METHODS

Participants

Female participants were from two projects within the International Price Foundation Genetic Studies of Eating Disorders.^{38, 39} Informed consent and IRB approval were obtained at all study sites.

BN Affected Relative Pair Study—The sample for this study included both probands and affected relatives. Probands met the following criteria: lifetime DSM-IV⁴⁰ diagnosis of BN, purging type, with the additional requirement of at least a 6 month period of binge eating and vomiting at least twice a week, and age between 13 and 65 years. Affected relatives were biological extended family members between the ages of 13 and 65 years, with a lifetime diagnosis of 1) DSM-IV BN, 2) modified DSM-IV AN (i.e., amenorrhea criterion not required), or 3) EDNOS. Exclusion criteria included premorbid weight that exceeded the BMI for the 95th percentile for their age and gender⁴¹ or whose high lifetime BMI was greater than 35. For the complete list of inclusion and exclusion criteria, see Kaye et al.³⁸

AN Trios Study—The sample for this study included individuals with AN and their parents. Probands met the following criteria: (1) DSM-IV lifetime diagnosis of AN, with or without amenorrhea; (2) low weight that is/was less than 5th percentile of BMI for age and gender;⁴¹ (3) onset of eating disorders prior to age 25; (4) weight that is/was controlled through restricted eating, excessive exercise, and/or purging; (5) age between 13 and 65 years; and (6) study diagnostic criteria met at least 3 years prior to study entry, to appropriately classify AN women as unlikely to develop binge eating. Research suggests most binge eating develops within the first 3 years of illness in AN.^{42–44} To ensure sample

homogeneity for genetic studies and to minimize the number of individuals with potential obesity-related genotypes, individuals were excluded if they reported maximum BMI since puberty $>27 \text{ kg/m}^2$

Comparison Group—In the AN Trios Study, healthy women between the ages of 18–65 years were recruited by advertisements to serve as a comparison group for the affected individuals. These women were primarily of European ancestry and were recruited at participating sites to broadly equate site, age range, and ancestry with the eating disorders groups. The comparison group had a lifetime adult BMI between 19 and 27 kg/m^2 . Comparison women were excluded if they: (1) reported any history of an eating disorder or disordered eating behaviors, as defined by a score of 20 or higher on the Eating Attitudes Test;⁴⁵ (2) had a first degree relative with an eating disorder; or (3) had the presence of an Axis I disorder as defined by the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID).⁴⁶

Measures

Eating Disorder Diagnosis—Lifetime history of eating disorders was assessed with the Structured Inventory of Anorexia Nervosa and Bulimic Syndromes (SIAB),⁴⁷ including lifetime minimum and maximum body mass index (BMI kg/m^2). Information regarding eating disorder duration and recovery was obtained by an expanded version of Module H of the SCID.⁴⁶ Participants were classified into diagnostic categories: (1) AN; (2) BN; (3) lifetime history of both AN and BN (ANBN); and (4) subthreshold AN or BN (EDNOS).

Demographic and Clinical Variables—Demographic information was collected using a questionnaire developed for the Price Foundation studies. For the current study, relationship status was collapsed into three categories: (1) never married, (2) married once or living with a partner or widowed, and (3) divorced or separated or remarried. The latter category includes remarried women in an effort to separate individuals who have experienced a significant change in relationship status due to problems in the relationship from those whose relationship is stable or ended for factors beyond the couple's control. Additionally, reproductive status was determined by the participant's report of whether or not she had a biological child. Questions regarding pregnancies that did not reach term were not asked.

Menstrual Status—Menstrual status was assessed using the SIAB.⁴⁷ Women were classified as follows: (1) normal; (2) oligomenorrhea; (3) hormone replacement (receiving hormone replacement, and it was clear that menses would not occur without hormones replacement); (4) secondary amenorrhea; and (5) primary amenorrhea. Comparison women were not asked about hormone replacement.

Statistical Analyses

Analyses were conducted using PROC GENMOD in SAS version 9.1.⁴⁸ Analysis of variance (ANOVA) compared eating disorder subtypes and controls on education and relationship status. Logistic regression analyses were conducted using generalized estimating equations (GEE) to test for significant differences in reproductive status across groups. For all models, age at time of interview was entered as a covariate. For regression models assessing reproductive status, relationship status was entered as a covariate. Corrections by GEE are not applicable for multinomial data.^{49–51} As this is an exploratory analysis with the expressed intention of informing domains for future investigations, we did not correct results for multiple comparisons. Significance tests were two-tailed.

RESULTS

Participants

The final sample included 2,096 female participants: 731 AN (35%), 258 BN (12%), 350 ANBN (17%), 60 EDNOS (3%), and 697 healthy controls (33%). Males were not included due to small sample size ($n = 28$), and 73 individuals were excluded due to missing data on the demographic questionnaire.

Clinical Variables

Table 1 describes clinical features across the sample and presents results from an ANOVA comparing these variables across the eating disorder groups and healthy controls. Statistically significant group differences were found for all variables, with the AN group being younger at interview and at onset, and with the lowest minimum and maximum lifetime BMI.

Table 2 presents the number and percent of each eating disorder group endorsing the various categories for education, relationship status, and reproductive status. Educational levels differed significantly across groups ($\chi^2 = 58.57$, $p < 0.001$, $df = 4$) with the controls reporting more education than participants in the eating disorder groups; however, no significant differences were observed across eating disorder subtypes. Relationship status ($\chi^2 = 4.45$, $p < 0.35$, $df = 4$) and reproductive status ($\chi^2 = 7.70$, $p < .11$, $df = 4$) did not differ across all groups: controls, AN, BN, ANBN and EDNOS.

Menstrual status was also compared across all groups (data not shown). Significant differences in menstrual status were observed ($\chi^2 = 1231.65$, $p < 0.001$, $df = 4$). All groups differed significantly from each other with the exception of BN and EDNOS which did not differ from each other. More control women reported normal menstrual cycles (60.4%) and more women in the AN (87.3%) and ANBN (79.8%) groups endorsed primary or secondary amenorrhea.

Association of clinical variables with education, relationship status, and reproduction

Table 3 presents means and standard deviations for clinical features in women with eating disorders, including age of onset, illness duration, age at interview, and lifetime minimum and maximum BMI, by level of education, by relationship status group, and by reproductive status. Because women in the different eating disorder groups did not differ on education, relationship status, and reproductive status, eating disorder subtype was not entered as a covariate for these analyses.

Table 4 presents the omnibus results for models predicting education, relationship status, and reproductive status. Controlling for age at interview, only age of onset ($\chi^2 = 12.76$, $p < 0.001$) and illness duration ($\chi^2 = 31.37$, $p < 0.001$) were significantly associated with education. Those who had a younger age of onset were less educated and those with shorter duration of illness were more educated.

Significant associations were observed between relationship status and lifetime minimum BMI ($\chi^2 = 23.68$, $p < 0.001$), lifetime maximum BMI ($\chi^2 = 14.15$, $p < 0.001$), and menstrual status ($\chi^2 = 17.28$, $p < 0.002$). All relationship groups were significantly different from each other on the BMI measures. Women with normal menstrual cycles were less likely to be 'never married' than women in the other menstrual status groups (data not shown).

Reproductive status was significantly associated with menstrual status ($\chi^2 = 13.71$, $p < 0.009$). Post hoc tests indicated women with normal menstrual cycles were more likely to have children than women with oligomenorrhea (OR = 2.16, 95% CI: 0.98, 4.77), hormone

replacement therapy (OR = 4.12, 95% CI: 1.66, 10.24), secondary amenorrhea (OR=2.20, 95% CI: 1.38, 3.50), or primary amenorrhea (OR = 2.54, 95% CI: 1.23, 5.24). No significant differences were observed between other menstrual groups.

DISCUSSION

This exploratory study aimed to enhance an understanding of basic sociodemographic characteristics and their relation to clinical features of eating disorders. Our results emphasize notable distinctions as well as similarities across groups. In this sample, eating disorders are clearly associated with educational attainment. Although there were no significant differences across eating disorder subtypes on level of education, as a group, women with eating disorders were less educated than controls. This result is somewhat surprising given the perfectionistic and achievement-oriented nature of individuals with eating disorders and their families,^{52, 53} anecdotal accounts of AN being strongly associated with a drive to achieve,⁵⁴ suggestions of academic overachievement in adolescents with AN,¹⁰ and evidence of higher than average IQ scores in eating disorders patients compared with controls.⁵⁵

Reasons for lower levels of education in women with eating disorders are unclear. Speculatively, neurocognitive impairments associated with more entrenched illness,^{56, 57} deficits that persist after clinical recovery,¹⁵ and adverse effects of illness burden on various aspects of academic functioning may play a role. Accordingly, we found shorter duration of illness to be associated with higher educational attainment, and earlier age at onset to be associated with lower educational attainment. However, we cannot definitively conclude that eating disorders alone impact education. Comorbid anxiety⁵⁸ and mood disorders³⁹ often accompany eating problems and impact overall functioning.

An unexpected finding was the lack of significant differences in relationship status between women with eating disorders and controls, especially given the healthy nature of our screened controls. Reports exist that are inline with our observations.^{17, 59} Women with eating disorders appear to be engaging in relationships, divorcing, and remaining single at rates relatively similar to healthy women.

As it is often assumed that women with eating disorders are less likely to reproduce, our finding that irregular menstruation is associated with childlessness is noteworthy. Menstrual irregularities in eating disorders are heterogeneous and clearly do not only occur in AN. Menstrual dysfunction can occur prior to appreciable weight loss and is associated with excessive exercise, polycystic ovary syndrome, binge eating and other biological and psychological factors⁶⁰ In our sample, a history of menstrual irregularity was more strongly associated with reproductive status than eating disorder subtype. Even so, there were no significant between group differences in reproductive status. Menstruation is one of many factors influencing conception and birth of child; personal desire, dedication to career or education, strained partnerships, diminished libido, partner infertility, personal commitments, and family stressors are also relevant. Despite clear differences on illness parameters across eating disorders groups, the observed differences did not generalize to the sociodemographic domains.

We acknowledge limitations to our study. First, the study was descriptive and cannot explain the reasons for a lack of observed differences, the causes of observed differences, why some observed differences do exist, or their implications for women with eating disorders and their families. Our data are also limited in that we are unable to address actual academic performance, pregnancy complications, or quality of relationships. Future research using more nuanced assessments is required to complete our understanding of the impact of eating

disorders on these facets of life. This sample was ascertained for participation in a genetics study. Factors influencing participation such as coming from a family with more than one eating disorder case or willing family participation may have introduced unknown bias into the sample. Similarly, the exclusion of current Axis I disorders in our comparison group makes the control sample healthier than the general population, rendering the lack of differences between women with eating disorders and controls even more remarkable. Finally, our sample was heterogeneous in terms of course of illness. Participants with lifetime diagnoses were sampled including both currently or formerly affected individuals. Illness severity may be better than diagnosis as an index of social functioning, and comparing affected versus recovered women could provide a fuller understanding of the impact of eating disorders on sociodemographic characteristics.

With these caveats in mind, this study's strength lies in examining sociodemographic characteristics in a large, well-defined cohort of women with and without eating disorders. One aim was to identify differences among and between the eating disorder subtypes on sociodemographic variables. Notably, relationship, reproduction, and education did not differ among women with eating disorders regardless of subtype. This finding counters some general misconceptions and stereotypes, particularly about women with AN not marrying or having children.³³ In these core social categories reflective of often desired milestones, women with eating disorders appear relatively similar.

Although eating disorders are indubitably severe, they do not preclude women from leading lives that at least ostensibly resemble unaffected women in terms of relationship and reproductive status. Our findings suggest we have a limited understanding of the multidimensional nature of the lives of women with eating disorders. In addition to the typical focus on symptom resolution, future research on outcome of eating disorders should carefully assess a full array of domains of functioning in order to provide a comprehensive evaluation of course of illness and quality of life.

Acknowledgments

Drs. Maxwell and Root were supported by National Institute of Health grant T32MH076694. Dr. Strober was supported in part by the Franklin Mint Endowed Chair in Eating Disorders. The authors wish to thank the Price Foundation for the support of the clinical collection of participants and support of data analysis. The authors acknowledge the staff of the Price Foundation Collaborative Group for their efforts in participant screening and clinical assessments. The authors are indebted to the participating families for their contribution of time and effort in support of this study. This study was also supported by grant MH-66117 from the National Institutes of Health, Bethesda, MD.

References

1. D'Abundo M, Chally P. Struggling with recovery: participant perspectives on battling an eating disorder. *Qual Health Res* 2004;14:1094–1106. [PubMed: 15359045]
2. Steinhausen H. The outcome of anorexia nervosa in the 20th century. *Am J Psychiatry* 2002;159:1284–1293. [PubMed: 12153817]
3. Steiner H, Lock J. Anorexia nervosa and bulimia nervosa in children and adolescents: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry* 1998;37:352–359. [PubMed: 9549954]
4. Couturier J, Lock J. What is recovery in adolescent anorexia nervosa? *Int J Eat Disord* 2006;39:550–555. [PubMed: 16791851]
5. Daig I, Herschbach P, Lehmann A, Knoll N, Decker O. Gender and age differences in domain-specific life satisfaction and the impact of depressive and anxiety symptoms: a general population survey from Germany. *Qual Life Res* 2009;18:669–678. [PubMed: 19430928]
6. Nevenon L, Norring C. Socio-economic variables and eating disorders: a comparison between patients and normal controls. *Eat Weight Disord* 2004;9:279–284. [PubMed: 15844400]

7. Wildes JE, Emery RE, Simons AD. The roles of ethnicity and culture in the development of eating disturbance and body dissatisfaction: a meta-analytic review. *Clin Psychol Rev* 2001;21:521–551. [PubMed: 11413866]
8. de la Rie S, Noordenbos G, Donker M, van Furth E. The patient's view on quality of life and eating disorders. *Int J Eat Disord* 2007;40:13–20. [PubMed: 16941625]
9. Bardone-Cone AM, Wonderlich SA, Frost RO, Bulik CM, Mitchell JE, Uppala S, et al. Perfectionism and eating disorders: current status and future directions. *Clin Psychol Rev* 2007;27:384–405. [PubMed: 17267086]
10. Dura JR, Bornstein RA. Differences between IQ and school achievement in anorexia nervosa. *J Clin Psychol* 1989;45:433–435. [PubMed: 2745732]
11. Wade TD, Tiggemann M, Bulik CM, Fairburn CG, Wray NR, Martin NG. Shared temperament risk factors for anorexia nervosa: a twin study. *Psychosom Med* 2008;70:239–244. [PubMed: 18158375]
12. Green MW, Elliman NA, Wakeling A, Rogers PJ. Cognitive functioning, weight change and therapy in anorexia nervosa. *J Psychiatr Res* 1996;30:401–410. [PubMed: 8923343]
13. Godart NT, Perdereau F, Curt F, Lang F, Venisse JL, Halfon O, et al. Predictive factors of social disability in anorexic and bulimic patients. *Eat Weight Disord* 2004;9:249–257. [PubMed: 15844396]
14. Ruuska J, Koivisto AM, Rantanen P, Kaltiala-Heino R. Psychosocial functioning needs attention in adolescent eating disorders. *Nord J Psychiatry* 2007;61:452–458. [PubMed: 18236312]
15. Bosanac P, Kurlender S, Stojanovska L, Hallam K, Norman T, McGrath C, et al. Neuropsychological study of underweight and “weight-recovered” anorexia nervosa compared with bulimia nervosa and normal controls. *Int J Eat Disord* 2007;40:613–621. [PubMed: 17607697]
16. Yanover T, Thompson JK. Self-reported interference with academic functioning and eating disordered symptoms: associations with multiple dimensions of body image. *Body Image* 2008;5:326–328. [PubMed: 18586583]
17. Keski-Rahkonen A, Hoek HW, Susser ES, Linna MS, Sihvola E, Raevuori A, et al. Epidemiology and course of anorexia nervosa in the community. *Am J Psychiatry* 2007;164:1259–1265. [PubMed: 17671290]
18. Berkman LF. The role of social relations in health promotion. *Psychosom Med* 1995;57:245–254. [PubMed: 7652125]
19. Bell S, Lee C. Transitions in emerging adulthood and stress among young Australian women. *Int J Behav Med* 2008;15:280–288. [PubMed: 19005927]
20. Kaplan RM, Kronick RG. Marital status and longevity in the United States population. *J Epidemiol Community Health* 2006;60:760–765. [PubMed: 16905719]
21. Bloks H, Van Furth EF, Callewaert I, Hoek HW. Coping strategies and recovery in patients with a severe eating disorder. *Eat Disord* 2004;12:157–169. [PubMed: 16864314]
22. Tiller JM, Sloane G, Schmidt U, Troop N, Power M, Treasure JL. Social support in patients with anorexia nervosa and bulimia nervosa. *Int J Eat Disord* 1997;21:31–38. [PubMed: 8986515]
23. Schmidt U, Evans K, Tiller J, Treasure J. Puberty, sexual milestones and abuse: how are they related in eating disorder patients? *Psychol Med* 1995;25:413–417. [PubMed: 7675928]
24. Keel PK, Baxter MG, Heatherton TF, Joiner TE Jr. A 20-year longitudinal study of body weight, dieting, and eating disorder symptoms. *J Abnorm Psychol* 2007;116:422–432. [PubMed: 17516772]
25. Van den Broucke S, Vandereycken W. Anorexia and bulimia nervosa in married patients: a review. *Compr Psychiatry* 1988;29:165–173. [PubMed: 3286109]
26. Van den Broucke S, Vandereycken W, Vertommen H. Marital intimacy in patients with an eating disorder: a controlled self-report study. *Br J Clin Psychol* 1995;34 (Pt 1):67–78. [PubMed: 7757040]
27. Van den Broucke S, Vandereycken W, Vertommen H. Marital communication in eating disorder patients: a controlled observational study. *Int J Eat Disord* 1995;17:1–21. [PubMed: 7894447]
28. Morgan CD, Wiederman MW, Pryor TL. Sexual functioning and attitudes of eating-disordered women: a follow-up study. *J Sex Marital Ther* 1995;21:67–77. [PubMed: 7643424]

29. Pinheiro AP, Raney TJ, Thornton LM, Fichter MM, Berrettini WH, Goldman D, et al. Sexual functioning in women with eating disorders. *Int J Eat Disord*. 2009
30. Crow S, Thuras P, Keel PK, Mitchell JE. Long-term menstrual and reproductive function in patients with bulimia nervosa. *Am J Psychiatry* 2002;159:1048–1050. [PubMed: 12042197]
31. Brinch M, Isager T, Tolstrup K. Anorexia nervosa and motherhood: reproduction pattern and mothering behavior of 50 women. *Acta Psychiatr Scand* 1988;77:611–617. [PubMed: 3269214]
32. Freizinger M, Franko DL, Dacey M, Okun B, Domar AD. The prevalence of eating disorders in infertile women. *Fertil Steril* 2010;93:72–28. [PubMed: 19006795]
33. Bulik C, Sullivan P, Fear J, Pickering A, Dawn A. Fertility and reproduction in women with anorexia nervosa: a controlled study. *J Clin Psychiatry* 1999;2:130–135. [PubMed: 10084645]
34. Poyastro Pinheiro A, Thornton LM, Plotnicov KH, Tozzi F, Klump KL, Berrettini WH, et al. Patterns of menstrual disturbance in eating disorders. *Int J Eat Disord* 2007;40:424–434. [PubMed: 17497704]
35. Carter FA, McIntosh VV, Frampton CM, Joyce PR, Bulik CM. Predictors of childbirth following treatment for bulimia nervosa. *Int J Eat Disord* 2003;34:337–342. [PubMed: 12949925]
36. Doll HA, Petersen SE, Stewart-Brown SL. Eating disorders and emotional and physical well-being: associations between student self-reports of eating disorders and quality of life as measured by the SF-36. *Qual Life Res* 2005;14:705–717. [PubMed: 16022064]
37. Mond JM, Hay PJ, Rodgers B, Owen C, Beumont PJ. Assessing quality of life in eating disorder patients. *Qual Life Res* 2005;14:171–178. [PubMed: 15789951]
38. Kaye WH, Devlin B, Barbarich N, Bulik CM, Thornton L, Bacanu SA, et al. Genetic analysis of bulimia nervosa: methods and sample description. *Int J Eat Disord* 2004;35:556–570. [PubMed: 15101071]
39. Reba L, Thornton L, Tozzi F, Klump KL, Brandt H, Crawford S, et al. Relationships between features associated with vomiting in purging-type eating disorders. *Int J Eat Disord* 2005;38:287–294. [PubMed: 16261604]
40. APA. *Diagnostic and Statistical Manual of Mental Disorders*. 4. Washington, DC: American Psychiatric Press; 2000. Text Revision
41. Hebebrand J, Himmelmann GW, Hesecker H, Schafer H, Remschmidt H. Use of percentiles for the body mass index in anorexia nervosa: diagnostic, epidemiological, and therapeutic considerations. *Int J Eat Disord* 1996;19:359–369. [PubMed: 9156689]
42. Bulik C, Sullivan P, Carter F, Joyce P. Initial manifestation of disordered eating behavior: dieting versus bingeing. *Int J Eat Disord* 1997;22:195–201. [PubMed: 9261659]
43. Eddy K, Keel P, Dorer D, Delinsky S, Franko D, Herzog D. Longitudinal comparison of anorexia nervosa subtypes. *Int J Eat Disord* 2002;31:191–201. [PubMed: 11920980]
44. Tozzi F, Thornton L, Klump K, Bulik C, Fichter M, Halmi K, et al. Symptom fluctuation in eating disorders: correlates of diagnostic crossover. *Am J Psychiatry* 2005;162:732–740. [PubMed: 15800146]
45. Garner D, Olmsted M, Bohr Y, Garfinkel P. The Eating Attitudes Test: psychometric features and clinical correlates. *Psychol Med* 1982;12:871–878. [PubMed: 6961471]
46. First, M.; Gibbon, M.; Williams, J.; Spitzer, P.; Staff, M. *SCID Screen Patient Questionnaire (SSPQ) and SCID SCREEN Patient Questionnaire-Extended (SSPQ-X)*, Computer Program for Windows TM, Software Manual. Washington, D.C: American Psychiatric Press, Inc; 1999.
47. Fichter M, Herpertz S, Quadflieg N, Herpertz-Dahlmann B. Structured interview for anorexic and bulimic disorders for DSM-IV and ICD-10: updated (third) revision. *Int J Eat Disord* 1998;24:227–249. [PubMed: 9741034]
48. SAS Institute Inc. *SAS/STATR Software: Version 9*. Cary, NC: SAS Institute, Inc; 2004.
49. Zeger S, Liang K. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics* 1986;42:121–130. [PubMed: 3719049]
50. Zeger SL, Liang KY, Albert PS. Models for longitudinal data: a generalized estimating equation approach. *Biometrics* 1988;44:1049–1060. [PubMed: 3233245]
51. Diggle, PJ.; Liang, KY.; Zeger, SL. *Analysis of longitudinal data*. Oxford: Clarendon Press; 1994.

52. Anderluh M, Tchanturia K, Rabe-Hesketh S, Collier D, Treasure J. Lifetime course of eating disorders: design and validity testing of a new strategy to define the eating disorders phenotype. *Psychol Med* 2009;39:105–114. [PubMed: 18377676]
53. Bardone-Cone AM, Sturm K, Lawson MA, Robinson DP, Smith R. Perfectionism across stages of recovery from eating disorders. *Int J Eat Disord*. 2009 Mar 23; [Epub before print].
54. Bruch, H. *Eating Disorders*. New York: Basic Books; 1973.
55. Blanz BJ, Detzner U, Lay B, Rose F, Schmidt MH. The intellectual functioning of adolescents with anorexia nervosa and bulimia nervosa. *Eur Child Adol Psychiatry* 1997;6:129–135.
56. Kingston K, Szmukler G, Andrewes D, Tress B, Desmond P. Neuropsychological and structural brain changes in anorexia nervosa before and after refeeding. *Psychol Med* 1996;26:15–28. [PubMed: 8643754]
57. Tchanturia K, Anderluh MB, Morris RG, Rabe-Hesketh S, Collier DA, Sanchez P, et al. Cognitive flexibility in anorexia nervosa and bulimia nervosa. *J Int Neuropsychol Soc* 2004;10:513–520. [PubMed: 15327730]
58. Kaye WH, Bulik CM, Thornton L, Barbarich N, Masters K. Comorbidity of anxiety disorders with anorexia and bulimia nervosa. *Am J Psychiatry* 2004;161:2215–2221. [PubMed: 15569892]
59. Halvorsen I, Andersen A, Heyerdahl S. Good outcome of adolescent onset anorexia nervosa after systematic treatment. Intermediate to long-term follow-up of a representative county-sample. *Eur Child Adolesc Psychiatry* 2004;13:295–306. [PubMed: 15490277]
60. Vyver E, Steinegger C, Katzman DK. Eating disorders and menstrual dysfunction in adolescents. *Ann NY Acad Sci* 2008;1135:253–264. [PubMed: 18574232]

Table 1

Means (SD) and group differences of demographic and eating disorder features across eating disorder subtypes and controls.

| | Controls (n = 697) Mean (SD) | AN (n = 731) Mean (SD) | BN (n = 258) Mean (SD) | ANBN (n = 350) Mean (SD) | EDNOS (n = 60) Mean (SD) | χ^2 (p-value) | Group Differences |
|---|---------------------------------|---------------------------|---------------------------|-----------------------------|-----------------------------|--------------------|---------------------------|
| Age at Interview (years) | 26.3 (8.3) | 25.8 (7.9) | 27.7 (9.0) | 29.0 (8.8) | 27.3 (8.9) | 40.12 (<.001) | Comparison, AN<BN, ANBN |
| Age of Onset (years) | --- | 16.3 (3.2) | 17.7 (3.7) | 16.9 (3.7) | 17.1 (3.2) | 33.02 (<.001) | AN<ANBN<BN |
| Eating Disorder Duration (years) | --- | 8.4 (7.0) | 9.0 (8.2) | 10.8 (7.7) | 7.1 (8.1) | 26.08 (<.001) | AN, BN, EDNOS< ANBN |
| Lifetime Minimum BMI ($\frac{\text{kg}}{\text{m}^2}$) | 20.4 (1.3) | 13.8 (1.9) | 19.3 (1.7) | 15.0 (1.8) | 18.9 (1.5) | 2960.82 (<.001) | AN<ANBN<BN, EDNOS<Control |
| Lifetime Maximum BMI ($\frac{\text{kg}}{\text{m}^2}$) | 23.2 (1.9) | 21.1 (2.4) | 25.6 (3.2) | 23.1 (2.7) | 24.1 (3.1) | 620.19 (<.001) | AN<ANBN, Control<EDNOS<BN |

Note. SD = standard deviation. AN = anorexia nervosa. BN = bulimia nervosa. ANBN = anorexia nervosa and bulimia nervosa. EDNOS = subthreshold anorexia nervosa or bulimia nervosa. ED = eating disorder. BMI = body mass index.

Table 2

Prevalence of education, relationship status, and reproductive status across eating disorder subtypes and controls.

| | Controls N (%) | AN N (%) | BN N (%) | ANBN N (%) | EDNOS N (%) |
|--|----------------|------------|------------|------------|-------------|
| Education | | | | | |
| Did Not Graduate High School | 14 (2.0) | 79 (10.9) | 17 (6.9) | 29 (8.5) | 13 (22.8) |
| High School Graduate or Some College | 322 (46.2) | 332 (46.0) | 116 (47.4) | 162 (47.2) | 22 (38.6) |
| Standard 4-Year College Degree | 227 (32.6) | 191 (26.5) | 86 (35.1) | 105 (30.6) | 13 (22.8) |
| Graduate Degree or Professional Training | 134 (19.2) | 120 (16.6) | 26 (10.6) | 47 (13.7) | 9 (15.8) |
| Relationship Status | | | | | |
| Never Married | 449 (64.5) | 495 (68.3) | 151 (58.7) | 181 (52.3) | 36 (61.0) |
| Married Once, Living Together or Widowed | 208 (29.9) | 176 (24.3) | 76 (29.6) | 126 (36.4) | 17 (28.8) |
| Divorced, Separated or Remarried | 39 (5.6) | 54 (7.4) | 30 (11.7) | 39 (11.3) | 6 (10.2) |
| Reproductive Status | | | | | |
| No Biological Child | 581 (83.4) | 630 (86.2) | 198 (76.7) | 260 (74.3) | 45 (75.0) |
| Biological Child | 116 (16.6) | 101 (13.8) | 60 (23.3) | 90 (25.7) | 15 (25.0) |

Note. AN = anorexia nervosa. BN = bulimia nervosa. ANBN = anorexia nervosa and bulimia nervosa. EDNOS = subthreshold anorexia nervosa or bulimia nervosa.

Table 3

Mean (SD) of age of onset, eating disorder duration, age at interview (in years) and lifetime minimum and maximum BMI by educational levels, relationship status, reproductive status as indicated by having a biological child in women with eating disorders.

| | Education Levels | | | | Relationship Status | | | Reproductive Status | |
|----------------------------------|--------------------------------------|--|--|--|-------------------------|---|--|--------------------------------|----------------------------|
| | Did Not Graduate High School (n=138) | High School Graduate or Some College (n=631) | Standard 4-Year College Degree (n=395) | Graduate Degree or Professional Training (n=202) | Never Married (n = 863) | Married Once, Living with Partner, Widowed(n = 395) | Divorced, Separated, Remarried (n = 129) | No Biological Child (n = 1133) | Biological Child (n = 266) |
| ED Age of Onset | 15.2 (3.3) | 16.4 (3.1) | 17.1 (3.3) | 18.0 (4.1) | 16.1 (2.9) | 17.4 (3.5) | 18.8 (5.2) | 16.4 (3.1) | 18.2 (4.4) |
| ED Duration | 4.8 (4.1) | 8.4 (7.8) | 9.9 (6.7) | 12.7 (8.2) | 6.6 (5.7) | 12.2 (7.8) | 16.3 (8.9) | 7.5 (6.2) | 15.6 (9.0) |
| Age at Interview | 20.0 (5.8) | 25.6 (8.4) | 28.6 (6.6) | 33.7 (8.3) | 23.4 (6.1) | 31.6 (7.9) | 37.7 (8.1) | 24.8 (6.9) | 36.5 (8.0) |
| Minimum BMI (kg/m ²) | 15.0 (2.7) | 15.3 (2.8) | 15.5 (2.9) | 15.2 (3.0) | 15.0 (2.9) | 15.8 (2.6) | 16.3 (2.8) | 15.2 (2.9) | 16.2 (2.7) |
| Maximum BMI (kg/m ²) | 21.2 (3.1) | 22.7 (3.2) | 22.8 (3.1) | 22.7 (3.0) | 22.1 (2.9) | 23.2 (3.2) | 24.1 (3.8) | 22.3 (3.0) | 23.9 (3.6) |

Note. SD = standard deviation. ED = eating disorder

Table 4

Results for models predicting education, relationship status, and reproductive status from age of onset, eating disorder duration, lifetime minimum and maximum BMI, and menstrual status of women with eating disorders.*

| | Education | Relationship Status | Reproductive Status |
|---|--------------------|---------------------|---------------------|
| | χ^2 (p-value) | χ^2 (p-value) | χ^2 (p-value) |
| Age of onset | 12.76 (<.001) | 3.58 (.06) | 0.01 (0.91) |
| ED Duration | 31.37 (<.001) | 3.51 (.07) | 0.01 (0.93) |
| Lifetime Minimum BMI (kg/m^2) | 0.17 (.68) | 23.68 (<.001) | 2.70 (0.11) |
| Lifetime Maximum BMI (kg/m^2) | 0.23 (.63) | 14.15 (<.001) | 1.53 (0.22) |
| Menstrual Status | 6.30 (0.18) | 17.28 (.002) | 13.71 (0.009) |

Note. OR = odds ratio. ED = eating disorder. BMI = body mass index.

* For all models, age at interview was entered as a covariate. For reproductive status, relationship status was also entered as a covariate.